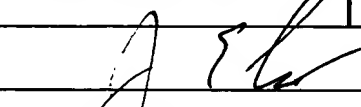


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| TYPE 12 TRANSMITTAL FORM (to be used for correspondence after initial filing) PATENT & TRADEMARK OFFICE MAR 08 2006 | Application Number | 09/897,848 |
| | Filing Date | July 2, 2001 |
| | Inventor(s) | Narayan L. GEHLOT |
| | Group Art Unit | 2638 |
| | Examiner Name | Dzung D. Tran |
| | Attorney Docket Number | 29250-001037/US |

| ENCLOSURES (check all that apply) | | | | |
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| SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT | | | | |
| Firm or Individual name | Harness, Dickey & Pierce, P.L.C. | Attorney Name John E. Curtin | | |
| | | Reg. No. 37,602 | | |
| Signature |  | | | |
| Date | March 8, 2006 | | | |

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IN THE U.S. PATENT AND TRADEMARK OFFICE

Appellants: Narayan L. GEHLOT

Application No.: 09/897,848

Art Unit: 2638

Filed: July 2, 2001

Examiner: Dzung D. Tran

For: OPTICAL CHANNEL OPERATING PARAMETERS MONITORING

Atty Docket No.: 29250-001037/US

March 8, 2006

APPELLANT'S REVISED BRIEF ON APPEAL

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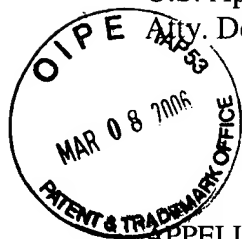


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APPELLANT'S REVISED BRIEF ON APPEAL

Appellants' initial appellate brief filed January 10, 2006 referred to a claim set that included claim amendments that were not entered by the Examiner in an Advisory Action.

Though the Appellants believe the Examiners decision not to enter these amendments is impermissible and a clear violation of 37 U.S.C. §116, Appellants have also recognized that the petition process required to reverse such a decision may not occur in a timely fashion (i.e., may not occur in time to aid Appellants in the present appeal process.)

Accordingly, Applicants submit this revised appellate brief which includes a revised claim set and corresponding arguments as well.

Appellants also note that their original Appellate brief contained many typographical errors. Appellants apologize for any confusion.

I. REAL PARTY IN INTEREST

The real party in interest in this appeal is Lucent Technologies Inc. Assignment of the application was submitted to the U.S. Patent and Trademark Office on September 10, 2001, and recorded on the same date at Reel 012149, Frame 0821.

II. RELATED APPEALS AND INTERFERENCES

There are no known appeals or interferences that will affect, be directly affected by, or have a bearing on the Board's decision in this Appeal.

III. EVIDENCE SUBMITTED UNDER CFR 1.130, 1.131, OR 1.132

None.

IV. DECISIONS RENDERED BY THE COURT OR THE BOARD IN RELATED APPEALS AND INTERFERENCES SECTION

None.

V. STATUS OF CLAIMS

Claims 1-29 are pending in the application, with claims 1, 12, 15, 26, 27, 28 and 29 being written in independent form. Claims 26 and 28 have been allowed while claims 7, 9, 13 and 24 have been objected to, the Examiner stating that the subject matter of these claims would be allowable if rewritten in independent form.

Claims 1, 3, 4, 15, 20-22 and 25 remain finally rejected under 35 U.S.C. §102(e). Claims 2, 5, 6, 8, 12, 16, 17, 23, 27 and 29 remain finally rejected under 35 U.S.C. §103(a). Claims 1-14, 17, 24 and 25 are being appealed.

VI. STATUS OF AMENDMENTS

A Request for Reconsideration ("Request") was filed on September 15, 2005. In an Advisory Action dated October 17, 2005, the Examiner stated that the Request was considered but Appellant's amendments were not entered.

VII. SUMMARY OF CLAIMED SUBJECT MATTER

A. Overview of the Subject Matter of the Independent Claims

Channel Operating Parameters (COP) provide information regarding performance in a communications system. Known methods for acquiring operating parameters are inadequate due to their expense, high service costs, and inability to provide output in the presence of communication data within acceptable time constraints.

To overcome these disadvantages, the present invention provides methods for acquiring operating parameters in a communications system that is operable to transmit a data signal, the method comprising the steps of:

- generating at least one operating parameter carrier having a frequency value *in a vicinity* of a null of a data spectrum of the data signal;
- modulating the at least one operating parameter carrier;
- summing the operating parameter carrier with the data signal;
- transmitting the summed signal; and
- recovering the at least one operating parameter carrier from the summed signal.

(see specification p. 3)

B. Additional Text from the Specification in Support of the Claims

This detailed description sets forth a system and method for channel operating parameter (COP) acquisition in a communications system. Channel operating parameters provide information about the operation of a channel network, such as whether the communications link is continuous, and whether hardware and software is operating correctly. The COP may also provide quality of service information regarding the channel being measured. In COP acquisition according to the principles of the invention, one or more COP carriers having frequencies in the vicinity of nulls in the frequency spectrum of the data signal are generated. The data signal is summed with the COP carriers and the resulting signal is transmitted. At the receiver, the data and the COP information are separated and processed. (see specification p. 4-5)

A block diagram of an exemplary communications system 100 according to the principles of the invention is shown in FIG. 1. (Appendix B) The system includes a transmitter 104, a communications channel 112 and a receiver 114. The transmitter includes a summer 108 and an amplifier 110. In the transmitter 104, the summer 108 adds the data signal 102 and the COP carrier 106. The COP carrier 106 is generated at a frequency in the vicinity of a null in the spectrum of the data signal 102. The summed signal 109 is amplified in the amplifier 100, and transmitted via the communications channel 112. The receiver 114 includes a demodulator 116 for demodulating the transmitted signal. The demodulator 116 recovers the COP carrier 106. An A to D converter 116 implements the autocorrelation function on the COP data stream in the hardware domain. The autocorrelation function recovers and restores the COP data bits for processing by a digital processor 122. The data signal is processed in a data receiver 118.

FIG. 2 (Appendix C) illustrates a data signal frequency spectrum 200 in the electrical domain. The curve 202 plots the power spectrum for data transmission having a line data rate of 10 Gb/sec. Nulls 204A and 206A occur at approximately 10 GHz and 20 GHz. In an exemplary system according to the principles of the invention, the COP carrier signals have a frequency value in the vicinity of the nulls 204A and 206A. For example, in the system 100 of FIG. 1, the transmitter 104 generates a COP carrier having a frequency of approximately 10 GHz or 20 GHz. If more than one COP carrier is used, the carriers can have frequencies in the successive nulls 204A and 206A (located at 10 GHz and 20 GHz respectively).

Alternatively, multiple COP carriers can be located in the vicinity of a single null, if the carriers are sufficiently separated. Twice the OCOP data bandwidth is the theoretic minimum frequency separation. This approach can be used when the successive nulls are separated in frequency by a value that does not permit acceptable recovery at the receiver. In FIG. 2, two COP carriers can be located in the vicinity of 10 GHz, as indicated by arrows 204A and 204B, or 20 GHz, as indicated by arrows 206A and 206B. It should be apparent that the illustrated spectrum plot 22 is exemplary, and that other spectrums could indicate transmitting COP carriers in different nulls. (see specification, p. 5-6)

In one exemplary embodiment, the system 100 of FIG. 1 can be configured as an optical system. In an optical system, the channel operating parameters are referred to as optical channel operating parameters (OCOP) and the carriers are OCOP carriers. The OCOP carrier frequencies have values in the vicinities of nulls in the spectrum, where minimal signal power due to spectrum frequencies from the line data is expected. The first null occurs at $1/T_b$ (where T_b is the bit period) for the digital line data rate (i.e. line clock rate/signaling rate) of T_b . For example, if the line data rate is 5 Gb/s, the first null occurs at 1/5 Gb/s, which equals 200 picoseconds T_b . The OCOP data rate can be restricted (Rg. 2 Mbits/sec) to minimize interference between the modulated carrier and the digital line data spectrum.

The OCOP carriers are modulated by OCOP NRZ data. Binary Phase Shift Keying is one suitable modulation technique. To limit the OCOP NRZ bandwidth, the modulated OCOP carrier can be passed through a filter such as a Bessel filter for low-phase distortion. OCOP data can be recovered from the Radio Frequency carriers (the OCOP carriers) using known detection techniques. The OCOP carriers can be sinusoids to reduce unwanted intermodulation products. The harmonics of a square wave carrier introduce phase noise at the OCOP receiver due to phase changes introduced by the fiberoptic channel, optical amplifiers and filters. At the receiver, the OCOP carriers are recovered by, for example, bandwidth filtering at the frequency of the data nulls.

FIG. 3 (Appendix D) shows a functional diagram for an exemplary OCOP transmitter 300 according to the principles of the invention. In this transmitter 300, the data signal 301 is summed in a summer 302 with the OCOP carriers 304 in the electrical domain. The OCOP oscillator 308 generates the OCOP carrier 309A. The carrier has a frequency value in the vicinity of a null in the electrical spectrum of the data signal 301, as previously explained. Process block 331 provides a carrier frequency 309B in a successive null. NRZ coded OCOP data is generated from RZ data and $RZ+T_b/2$ data in the multipliers 306. An NRZ coded signal for a given data stream is equivalent to the sum of two RZ coded signals for that data stream. The summer 302 provides the summer OCOP and data signals 310, which is used to

modulate an optical signal in the external modulator 312. The modulator 312 provides an optical channel 314. (see specification p. 6-7)

The use of two RZ encoded data signals to generate an NRZ encoded signal is explained in United States Patent Application No. _____, entitled "System and Method for Generating NRZ Signals from RZ signals in Communications Networks." A "1" in a bit of the data as represented in RZ has a pulse width $T/2$, which is half that of the data as represented in NRZ code. Each coded RZ bit can be delayed by $T/2$ to derive a replication of that RZ coding with a delay of $\frac{1}{2}$ the clock interval. The RZ signal is then summed with the delayed RZ signal to derive a data coding of NRZ at the receiver, which is the equivalent of NRZ of the original data. This can be implemented in a communication system by transmitting RZ coded data and its delayed counterpart so that a RZ coded signal can be used at the receiver to generate a NRZ signal with suitable compensation for non-linearities introduced by the fiber. Compensation can be introduced by manipulating the RZ bits (e.g. sliding the bits relative to each other) in the transmitter or receiver.

The resulting pair of OCOP signals form a bit sequence. To maximize the information transmitted and to boost noise immunity, the NRZ data can be transmitted as a pseudo random bit sequence (PRBS) packet and zeroes. Correlation at the receiver is used to recover the bit sequence and unique coding is used to define the data packets. Differential encoding can be used to insure low power at DC and to eliminate error propagation. The number of bits in a packet is governed by the minimum separation between repeaters and the pair of OCOP data line/clock rate. For example, where the OCOP clock rate is 2 Mb/second and the minimum distance between optical repeaters is equal to or more than 13 Km, the OCOP packet may be optimized to a 128 bit length.

In FIG. 3, (Appendix D) summation of the OCOP signal 304 and the data signal 301 occurs in the optical domain. The oscillator 308 generates the OCOP carriers, which are modulated by the OCOP data in the multiplier 306. An external modulator 313 provides an optical OCOP signal. The data signal 301 also modulates an optical carrier in an external modulator 312. An optical coupler 315 sums the modulated optical OCOP carriers and the modulated optical data carrier. Like in the communications system of FIG. 3A, the OCOP carriers can be used to transmit RZ data and $RZ + 1/2T_b$, which can be recovered as NRZ data in the receiver. (see specification, p. 7-8)

FIG. 4 (Appendix E) shows a functional block diagram 400 for another exemplary transmitter according to the principles of the invention. This transmitter 400 is for use in an optical system implementing a wavelength division multiplexing (WDM) transmission format. In an oscillator 410 an

OCOP carrier pair is generated. The carriers are sinusoidal and separated in frequency such that one carrier carries RZ data, and the other carries a replica of the RZ data delayed by $\frac{1}{2}$ of the clock interval, for example $\frac{1}{2}$ (2 MB/s data). The frequencies of the carriers are in the vicinity of data nulls for the data spectrum. In the pseudo random bit sequence generator 402, a PRBS of 2 Mb/s (128 bits/packet) is generated and processed by a differential encoder 404. The outputs of the encoder 404 and the OCOP carriers are multiplied by the multiplier 408.

An optical coupler 416 splits the output from a laser diode 418. A bandpass filter 412 bandlimits the output of the multiplier 408 and provides the bandlimited OCOP signals to an optical modulator 414. The information signal, for example NRZ digital line data, modulates the optical carrier in the optical modulator 422. The outputs of the modulators 414 and 422 are amplified in amplifiers 424 and 426. Another optical coupler 428 forms an optical summation of the signals, which is amplified in amplifier 430 prior to transmission over the optical channel 432. A noise switch 407 selectively connects and disconnects the encoder output to the multiplier 408. When the switch 407 is open, no measurement is taken and the output at the receiver is the system noise.

In another transmitter 500 embodiment, shown in FIG.5, (Appendix F) the digital line data 502 is electrically summed with the OCOP signal 506. The summed signal 508 modulates the optical signal provided by the laser diode 510 in an optical modulator 512. The modulated signal 514 is amplified in an amplifier 516 for transmission over the system channel 518. The operation of the OCOP carrier generator 520, multiplier 524, PRBS generator 528 and encoder 526 are the same as for the transmitter 400 of FIG. 4. (see specification p. 8-9)

At the receiver, the OCOP signal is manipulated to receive NRZ bits against transmitted RZ bits. The receiver detects the RZ bits and restores them to NRZ for information retrieval. An exemplary receiver 600 is shown in FIG. 6. (Appendix G) The incoming signal 602 includes the information signal and the OCOP signal. The information signal, which is NRZ digital data in this example, is routed to the data receiver 605 via an optical coupler 604. The OCOP signal is routed by the coupler 604 to an amplifier 608. The amplified signal is split in an optical coupler 610. Half of the signal is processed by an amplifier 612 and an optical isolator 620, and the other half is delayed in the optical delay element 614. The optical delay is determined by the OCOP data rate. The delay elements permit manipulation of the RZ data bits to compensate for the nonlinearities, as previously described. In the example, the OCOP data rate is 2 Mb/s and a delay of $.5 \times 10^{-6}$ seconds is desired to recover NRZ bits. For an optical delay of

5x10⁻⁶ s/meter, 100 meters of optical fiber will impose sufficient delay. Delay can also be generated in the electrical domain or with other passive optical components.

The two halves of the optical power are amplified by amplifiers 612 and 616 and isolated in optical isolators 618 and 620, respectively. Optical to electrical converters (PIN diodes, for example) 624 and 626 respectively convert the optical signals to electrical signals, where they are bandpass limited in filters 623 and 625. A multiplier 626 multiplies the two signals and a low pass filter 628 processes the multiplied signal. The output 630 of the low pass filter 628 is a bit stream carrying the OCOP data 630. The analog data signal is processed by an A/D converter 632 so that signal processing can be implemented in a signal-processing unit 634. The A/D converter implements autocorrelation and reduces or eliminates clock regeneration requirements.

FIG. 7 (Appendix H) shows another exemplary receiver 700. In this receiver 700, the OCOP signal is not split. Instead, a highly stable local RF oscillator 720 is used to demodulate the OCOP signal. The local oscillator has the same specifications as in the transmitter oscillator. The operation of the amplifier 718, optical isolator 707, O/E converter 704, bandpass filters 708 and 708, multiplier 710, low pass filter 712, A/D converter 714 and signal processor are explained with reference to the receiver 600 of FIG. 6. (see specification, p. 9-10)

FIG. 8 (Appendix I) shows a flowchart 800 illustrating exemplary processing for noise measurement and repeater data measurement according to the principles of the invention. In the first step 810, the following input parameter values are initialized: s_1 , the minimum distance between repeaters (specified as Km); s_2 , the maximum distance between adjacent end-to-end OCOP locations (specified as Km); ω , the OCOP clock rate (specified as Mbit/sec), and δ , the optical delay (specified as sec/Km). In a preferred embodiment, a user can be prompted to supply the values of these parameters. In step 820 the number of bits in a packet is computed. In step 830, the packet spread p , expressed in Km units is computed according to the equation $n = (2*s_2) / p$. In step 850, T_{next} , the time between packet transmissions, is computed according to the equation $T_{next} = n * (b / \omega)$.

In the next step 860, a timer is started. The purpose of this timer is to control the amount of time for which measurements are taken. When the timer is started, the elapsed time, denoted $T_{elapsed}$, is set to 0. In step 865, a noise measurement is performed and the measured value is inserted into an array NOISE. In step 870, $T_{elapsed}$ is compared to T_{next} : if it is less, control goes back to step 865 for further noise measurement; otherwise, control proceeds to step 875. In step 875, the timer is reinitialized to $T_{elapsed} = 0$. In step 880, the repeater data measurement is performed and the measured value is inserted into an array

Z. In step 885, T_{elapsed} is compared to T_{next} ; if it is less, control goes back to step 880, otherwise, flowchart 800 terminates, as at 890, signaling the end of the first and second stages of the three-stage method.

FIG. 9 (Appendix J) shows a flowchart 900 illustrating exemplary signal processing of the measured data. In the first step 910, the convolution matrix of the measured noise **outn** is computed and stored in matrix **repeatern**. In step 920, the convolution matrix of the measured repeater data **out** is computed and stored in matrix **repeater**. In step 930, the Integrate and Dump algorithm is applied to **repeatern** and stored in matrix **out1n**. In step 940, the Integrate and Dump algorithm is applied to **repeater** and stored in matrix **out1**. Note that in alternative embodiments of the method, the Integrate algorithm can be applied in lieu of Integrate and Dump. In the first step 950, repeater autocorrelation matrix **a** is computed according to the equation $\mathbf{a} = \mathbf{out} - \mathbf{outn}$. Appendix A includes exemplary data runs, output graphs, and MATLAB codes for processing according to the principles of the invention.

It should be understood that the foregoing description of exemplary systems and methods according to the principles of the invention are illustrative only, and are not intended to limit the scope of the invention. (see specification p. 11-12)

VIII. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

Appellants seek the Board's review of the rejection of claims 1, 3, 4 and 25 under 35 U.S.C. §102(e) and claims 2, 5, 6, 8, 10-12, 14 and 17 under 35 U.S.C. §103(a). With respect to "objected to" claims 7, 9, 13 and 24 Appellants reserve their rights to rewrite these claims in independent form after the Board has reached its decision regarding the present appeal. As a result, the subject matter of these claims will not be addressed here.

IX. ARGUMENTS

A. The Section 102 Rejections Based on Habel et al.

Claims 1, 3, 4 and 25 were rejected under 35 U.S.C. §102(e) as being anticipated by Habel et al., U.S. Patent No. 6,592,273 ("Habel"). Appellant respectfully disagrees and traverses these rejections for at least the following reasons.

Each of claims 1, 3, and 4 include the feature of generating at least one operating parameter carrier having a frequency value *in a vicinity of a null*. In contrast, the frequency f_{ch} disclosed in Habel is located at a null. Placing a carrier at a null causes significant interference with an RZ formatted data,

which is why Habel is not applicable to RZ data. Habel recognizes this. In contrast, the present invention requires that the carrier be placed in a vicinity of a null in order to make it possible to use RZ and NRZ data. Accordingly, because Habel does not disclose each and every feature of the present invention, Habel cannot anticipate the subject matter of claims 1, 3, and 4.

Appellant notes the comments in the "Continuation Sheet" of the Examiner's October 17, 2005 Advisory Action. The Examiner appears to: (a) equate the location of a carrier at a null with one in the vicinity of a null; and (b) takes the position that the Appellant also adopted this position in the specification.

Both are incorrect.

First, if an RZ carrier (e.g., clock signal) is located at a null, the clock signal will be lost and it will be next to impossible to recover data associated with the clock signal. In sum, locating an RZ carrier, in the vicinity of a null is not the same as locating it at a null. The former allows the frequency/clock signal and data to be recovered; the latter does not.

Next, the excerpts from the specification referred to by the Examiner, namely page 5, lines 16-18 and Figure 2, do not equate a carrier placed at a null with one placed in the vicinity of a null. The nulls in Fig. 2 are described as being located at 10 GHz and 20 GHz, while the carrier signals are described as being placed "in the vicinity of the nulls", not at the null. The only reference to "at" a null in this excerpt refers to the location of the nulls themselves, not the carrier frequencies.

With respect to claims 4 and 25 these claims include the feature of, among other things, one or more sinusoidal operating parameter carriers.

Contrary to the statement made by the Examiner on page 3 of the Final Office Action (last two lines) and the comments in the "Continuation" sheet of the Advisory Action, Habel's carrier, f_{ch} , is not a sinusoid. In the Final Office Action, the Examiner directs the Appellant's attention to Figure 1 where there is shown a carrier f_{ch} 20 located at a null. Though the location of the carrier is shown, the type of signal, e.g., sinusoidal, of the carrier is not shown.

In fact, a close reading of Habel results in the conclusion that the carrier frequency, f_{ch} , is in fact a square wave not a sinusoidal wave.

For example, Habel describes the operating carrier f_{ch} as being generated by a clock circuit 7 (see Figure 1 and column 3, lines 35-40). Though the clock circuits may initially use a sinusoid, after filtering the output of the clock circuit is a square wave, not a sinusoidal wave, as required by claims 12, 16, 23, 27 and 29.

In sum, Habel does not disclose or suggest the generation of sinusoidal operating parameter carriers.

Accordingly, Appellant requests that the members of the Board reverse the decision of the Examiner and allow claims 1, 3, 4 and 25.

B. The Section 103 Rejections Based on Habel and Bruene

Claims 2, 5, 6, 8, 12, and 17 were rejected under 35 U.S.C. §103(a) as being unpatentable over Habel in view of Bruene, U.S. Patent No. 4,302,844 ("Bruene"). Appellant respectfully disagrees.

With respect to claims 2, 5, 6, and 8 Appellant notes that these claims depend on independent claim 1 and are, therefore, patentable over the combination of Habel and Bruene for the reasons stated above with respect to claim 1 and for the additional reason that Bruene does not overcome the deficiencies of Habel discussed above.

With respect to claims 12 and 17 these claims include the feature of, among other things, one or more sinusoidal operating parameter carriers. As discussed above, Habel does not disclose such a carrier. Bruene does not make up for this deficiency.

Appellant respectfully requests that the members of the Board reverse the decision of the Examiner and allow claims 2, 5, 6, 8, 12 and 17.

C. The Section 103 Rejections Based on Habel and Davarian

Claims 10, 11 and 14 were rejected under 35 U.S.C. §103(a) as being unpatentable over Habel in view of Davarian, U.S. Patent No. 4,675,880 ("Davarian"). Appellant respectfully disagrees.

Initially, Appellant notes that claims 10, 11 and 14 depend on independent claims 1 and 12 and are therefore patentable over the combination of Habel and Davarian for the reasons set forth above regarding those claims 1 and 12 and for the additional reason that Davarian does not make up for the deficiencies of Habel discussed above.

In addition, as Appellant has stated in previous responses, Davarian does not disclose the generation of an operating parameter carrier. Rather, Davarian relates to a calibration pilot tone. Therefore, Appellant respectfully submits that one of ordinary skill in the art would not be motivated to combine Habel and Davarian because to do so would require Habel to change its principle of operation in

APPELLANT'S REVISED BRIEF ON APPEAL
U.S. Application No.: 09/897,848
Atty. Docket: 29250-001037/US

order to generate a calibration pilot tone or require Davarian to change its principle of operation to generate an operating parameter carrier. Neither is permissible (see MPEP 2143.01).

Accordingly, Appellant respectfully requests that the members of the Board reverse the decision of the Examiner and allow claims 10, 11 and 14.

X. CONCLUSION

Appellants respectfully request the Board to reverse the Examiner's rejections and allow claims 1-14, 17, 24 and 25.

The Commissioner is authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 08-0750 for any additional fees required under 37 C.F.R. § 1.16 or under 37 C.F.R. § 1.17; particularly, extension of time fees.

Respectfully submitted,

HARNESS, DICKEY, & PIERCE, P.L.C.

By: _____

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JEC:ame

IN THE CLAIMS

Kindly amend claims 15, 27 and 29 as follows and delete claim 17 without prejudice to, or disclaimer of, the subject matter therein.

The following is a complete listing of revised claims with a status identifier in parenthesis.

LISTING OF CLAIMS

1. (Previously Presented) A method for acquiring operating parameters in a communications system operable to transmit a data signal, the method comprising the steps of:

generating at least one operating parameter carrier having a frequency value in a vicinity of a null, associated with a data rate bit period, of a data spectrum of the data signal;

modulating the at least one operating parameter carrier;

summing the operation parameter carrier with the data signal;

transmitting the summed signal; and

recovering the at least one operating parameter carrier from the summed signal.

2. (Original) The method of claim 1 wherein the generating step generates at least another operating parameter carrier having another frequency value in the vicinity of the null of the data spectrum.

3. (Original) The method of claim 1 wherein the communications system comprises at least one optical channel.

4. (Original) The method of claim 1 wherein the at least one operating parameter carrier is a sinusoid.

5. (Original) The method of claim 1 wherein the data spectrum of the data signal comprises a plurality of nulls, the method comprising the further steps of:

generating at least another operating parameter carrier having a frequency value in another of the plurality of nulls; and

summing the another operating parameter carrier with the data signal,

wherein the recovering step recovers the another operating parameter carrier.

6. (Original) The method of claim 5 wherein the communications system comprises a wavelength division multiplexed communications system.

7. (Original) The method of claim 6 wherein the data spectrum is an RZ spectrum.

8. (Original) The method of claim 6 wherein the data spectrum is an NRZ spectrum.

9. (Original) The method of claim 8 wherein the demodulating step includes the further steps of:

transmitting RZ format data; and

recovering NRZ format data from the RZ format data.

10. (Original) The method of claim 1 further comprising the step of bandwidth limiting the at least one operating parameter carrier.

11. (Original) The method of claim 1 wherein the demodulating step further includes the step of bandwidth filtering the summed signal.

12. (Previously Presented) A method for optical channel operating parameter acquisition in a communications system operable to transmit an NRZ data signal, comprising the steps of:

determining a spectrum for the NRZ data;

generating a first sinusoidal operating parameter carrier having a frequency at a first null, associated with a data rate bit period, in the spectrum and a second sinusoidal operating parameter carrier having a frequency at a second null, associated with the data bit rate period, in the spectrum, the second null being successive to the first null in the spectrum;

summing the first operating parameter carrier, the second operating parameter carrier and the NRZ data signal;

transmitting the summed signal; and

at a receiver, recovering the operating parameter carriers from the summed signal.

13. (Original) The method of claim 12 wherein the optical operating parameter carriers are modulated by NRZ operating parameter data, the method comprising the further steps of:

representing the NRZ operating parameter data in RZ format;

modulating the first carrier with the RZ format data; and

modulating the second carrier with the RZ format data,

the recovering step including the step of processing the RZ format data to provide NRZ operating parameter data.

14. (Original) The method of claim 12 wherein the recovering step includes the step of bandwidth filtering the summed signal.

15. (Previously Presented) A communications system comprising:

a channel;

a transmitter for transmitting a data signal, the data signal having a spectrum, the transmitter including:

an operating parameter carrier generator operable to provide operating parameter carrier at a frequency having a value in a null, associated with a data rate bit period, of the spectrum; and

a summer for summing the operating parameter carrier and the data signal, wherein the transmitter transmits the summed signal over the channel; and

a receiver for receiving the summed signal, the receiver operable to recover the operating parameter carrier.

16. (Original) The communications system of claim 15 wherein the spectrum includes a plurality of nulls, the generator operable to provide another operating channel parameter carrier having a frequency in a successive one of the nulls.

17. (Original) The communications system of claim 16 wherein the operating channel parameter carriers are sinusoidal.

18. (Original) The communications system of claim 15 wherein the receiver includes a bandwidth filter for recovering the operating parameter carrier.

19. (Original) The communication system of claim 15 wherein the transmitter includes a filter for bandwidth limiting the summed signal.

20. (Original) The communications system of claim 15 wherein the channel includes an optical channel, the summer including an optocoupler.

21. (Original) The communications system of claim 20 wherein the communications system implements WDM.

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22. (Original) The communications system of claim 21 wherein the data signal is an NRZ data signal.

23. (Original) The communications system of claim 22 wherein the spectrum includes a plurality of nulls, the generator operable to provide another operating channel parameter carrier having a frequency in a successive one of the nulls.

24. (Original) The communications system of claim 23 wherein the operating channel parameter carriers carry RZ format parameter data, the receiver further including a processor for providing NRZ format parameter data from the RZ parameter data.

25. (Original) The communications system of claim 15 wherein the operating parameter carrier is a sinusoid.

26. (Original) A communications system operable to transmit over an optical channel, comprising:

a transmitter for transmitting a data signal, the data signal having a spectrum, the transmitter including:

an operating parameter carrier generator operable to provide a first sinusoidal operating parameter carrier and a second sinusoidal operating parameter carrier, the first carrier having a frequency located in a null of the spectrum and the second carrier having a frequency located in a successive null in the spectrum, and

a summer for summing the operating parameter carriers and the data signal, wherein the transmitter transmits the summed signal over the channel, the carriers being modulated by NRZ operating parameter data; and

a receiver for receiving the summed signal, the receiver including:

- a demodulator operable to recover the operating parameter carriers; and
- a processor for providing NRZ operating parameter data from the RZ operating parameter data.

27. (Previously Presented) A method for acquiring operating parameters in a wavelength division multiplexed communications system operable to transmit a data signal, the method comprising the steps of:

- generating at least two operating parameter carriers, each having a frequency value in a vicinity of a null, associated with a data rate bit period, of an RZ or NRZ data spectrum of the data signal;
- modulating the at least two operating parameter carriers;
- summing the operation parameter carriers with the data signal;
- transmitting the summed signal; and
- recovering NRZ formatted data from the at least two operating parameter carriers from the summed signal.

28. (Previously Presented) A method for optical channel operating parameter acquisition in a communications system operable to transmit an NRZ data signal, comprising the steps of:

- determining a spectrum for the NRZ data;
- generating a first sinusoidal operating parameter carrier having a frequency at a first null, associated with a data rate bit period, in the spectrum and a second sinusoidal operating parameter carrier having a frequency at a second null, associated with the data rate bit period, in the spectrum, the second null being successive to the first null in the spectrum;
- modulating the operating parameter carriers using NRZ operating parameter data, including;

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representing the NRZ operating parameter data in an RZ format;
modulating the first carrier with the RZ formatted data; and
modulating the second carrier with the RZ formatted data;
summing the first operating parameter carrier, the second operating parameter carrier and the NRZ data signal;
transmitting the summed signal; and
at a receiver, recovering the operating parameter carriers from the summed signal by processing the RZ formatted data to provide NRZ operating parameter data.

29. (Previously Presented) A wavelength division multiplexed communications system comprising:

an optical channel;
a transmitter for transmitting an NRZ or RZ formatted data signal, the data signal having a spectrum, the transmitter including:
an operating parameter carrier generator operable to provide at least two operating parameter carriers, each at a frequency having a value in a null of a spectrum that includes a plurality of nulls, each null associated with a data rate bit period; and
a summer, including an optocoupler, for summing the operating parameter carriers and the data signal, wherein the transmitter transmits the summed signal over the channel; and
a receiver for receiving the summed signal, the receiver operable to recover NRZ data from RZ or NRZ parameter data.



FIG. 1

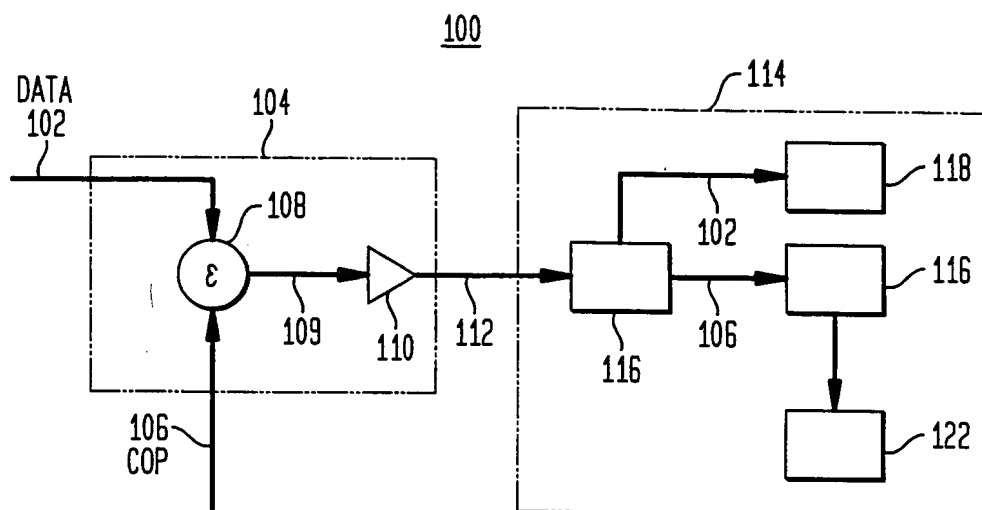
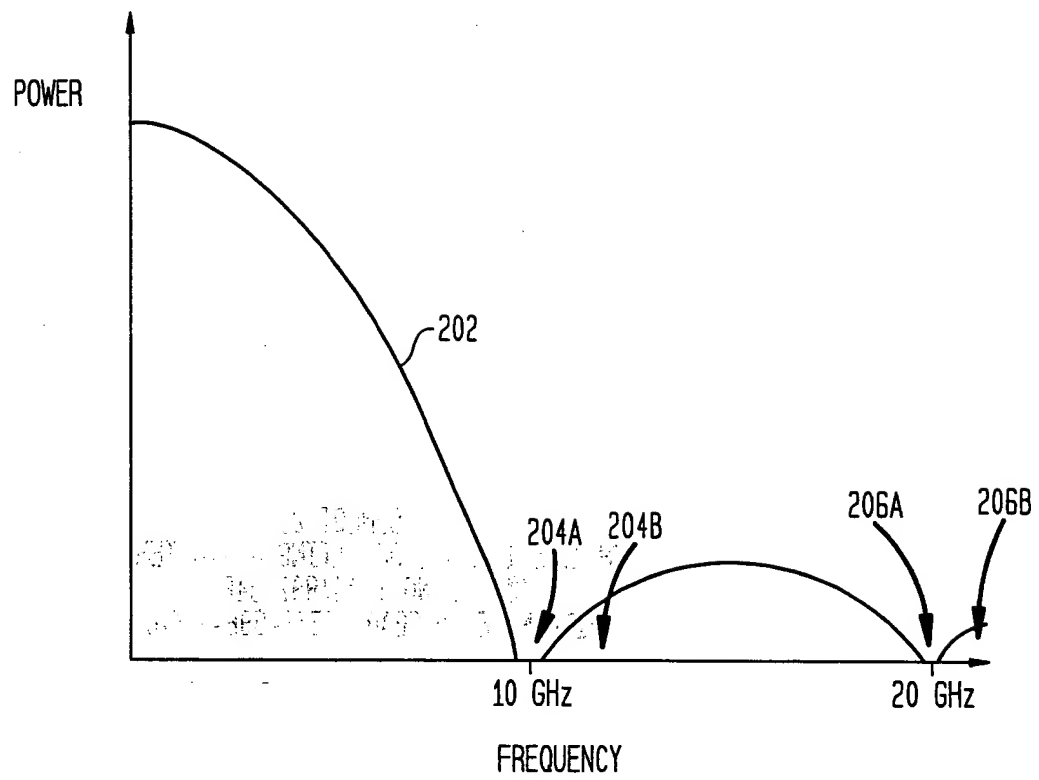


FIG. 2

200



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FIG. 3B

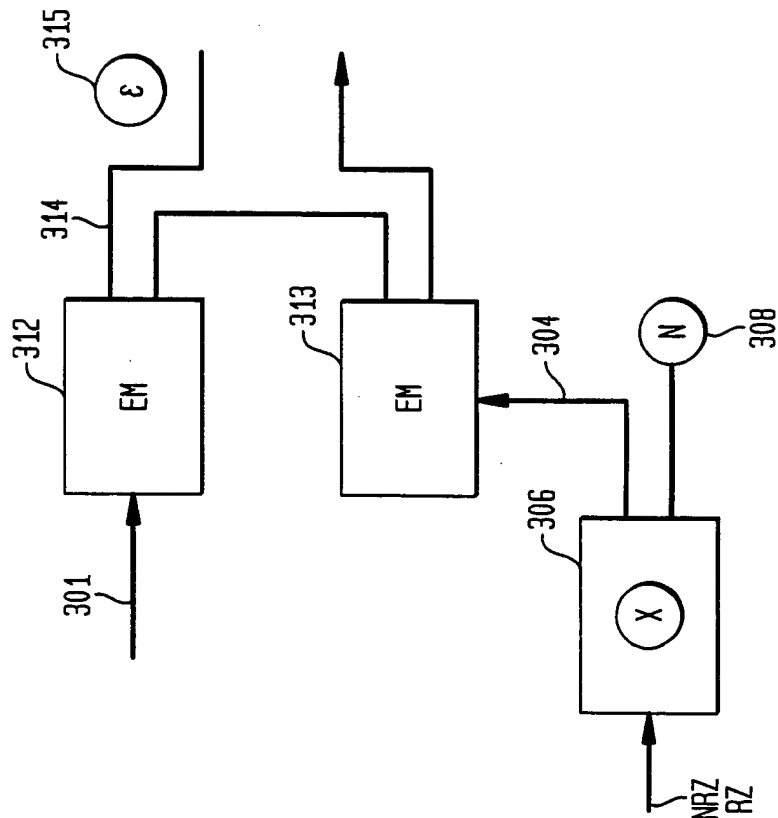
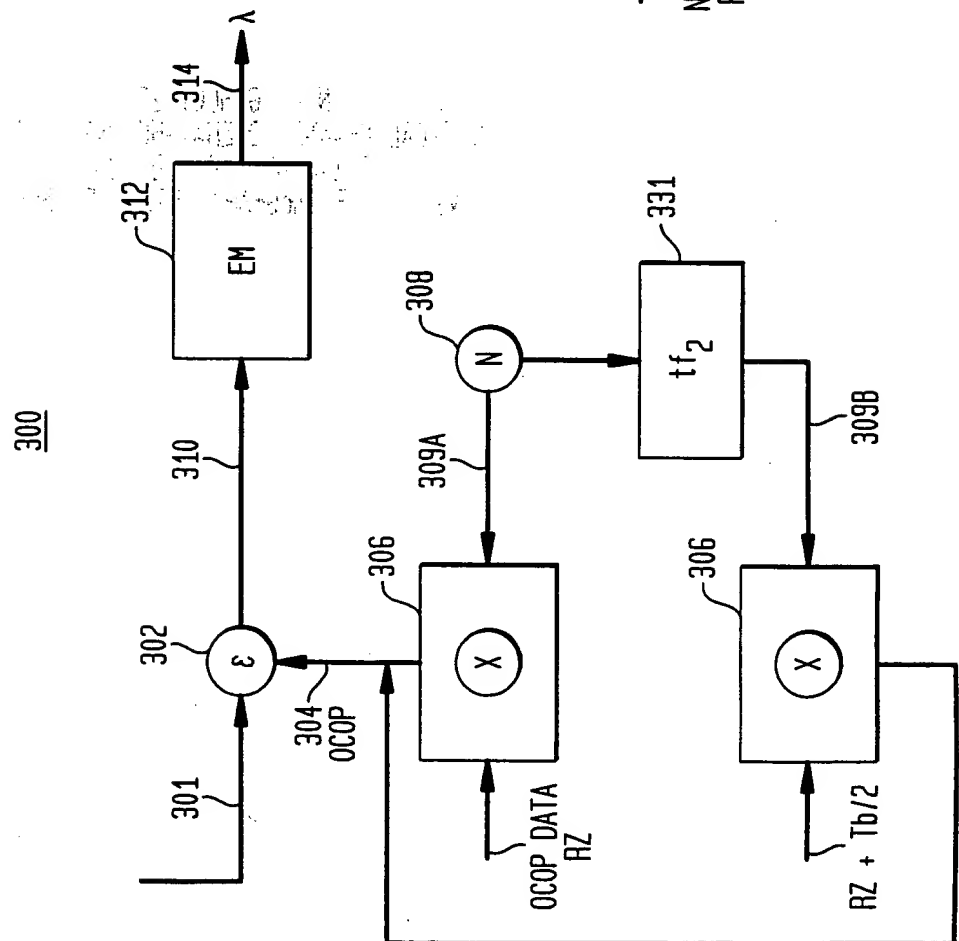


FIG. 3A



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FIG. 4

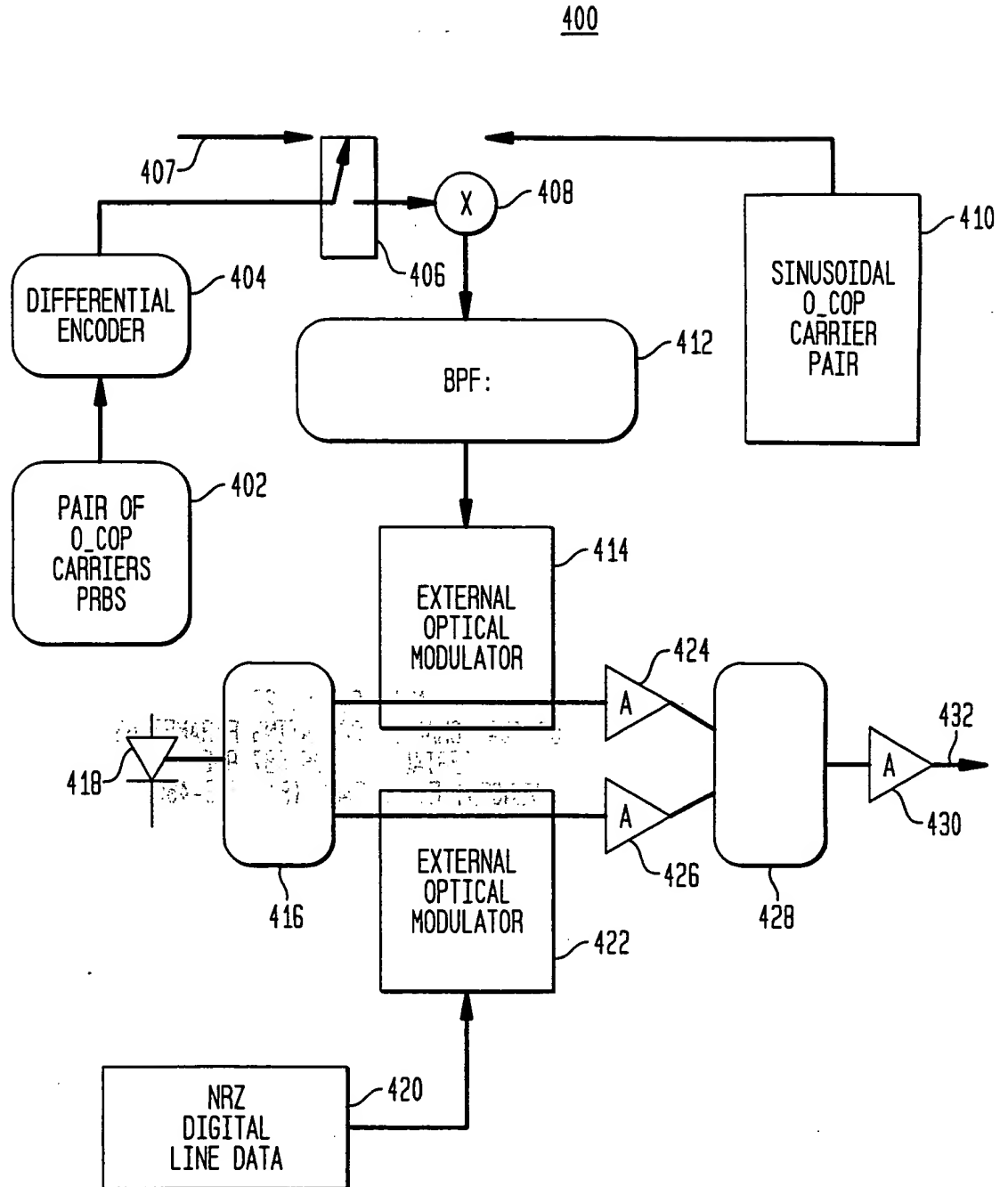
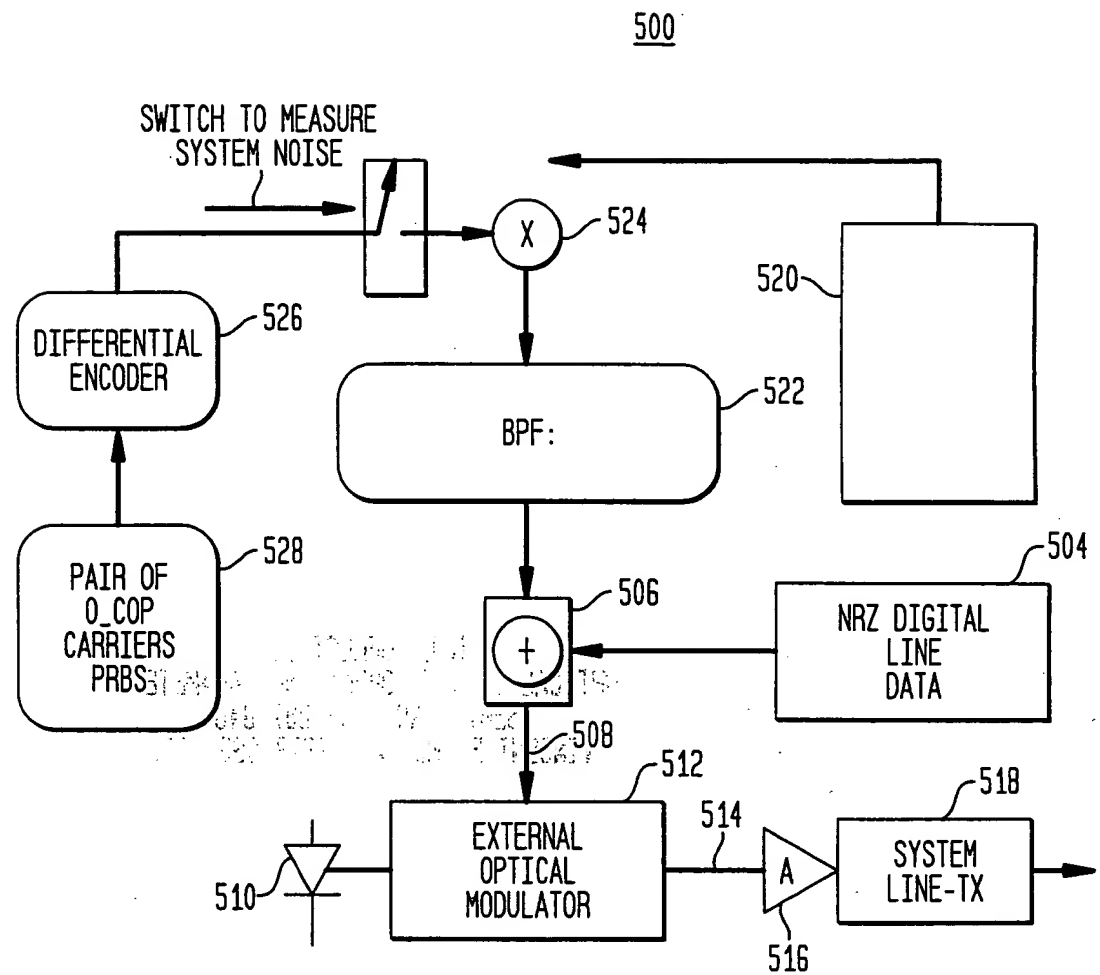


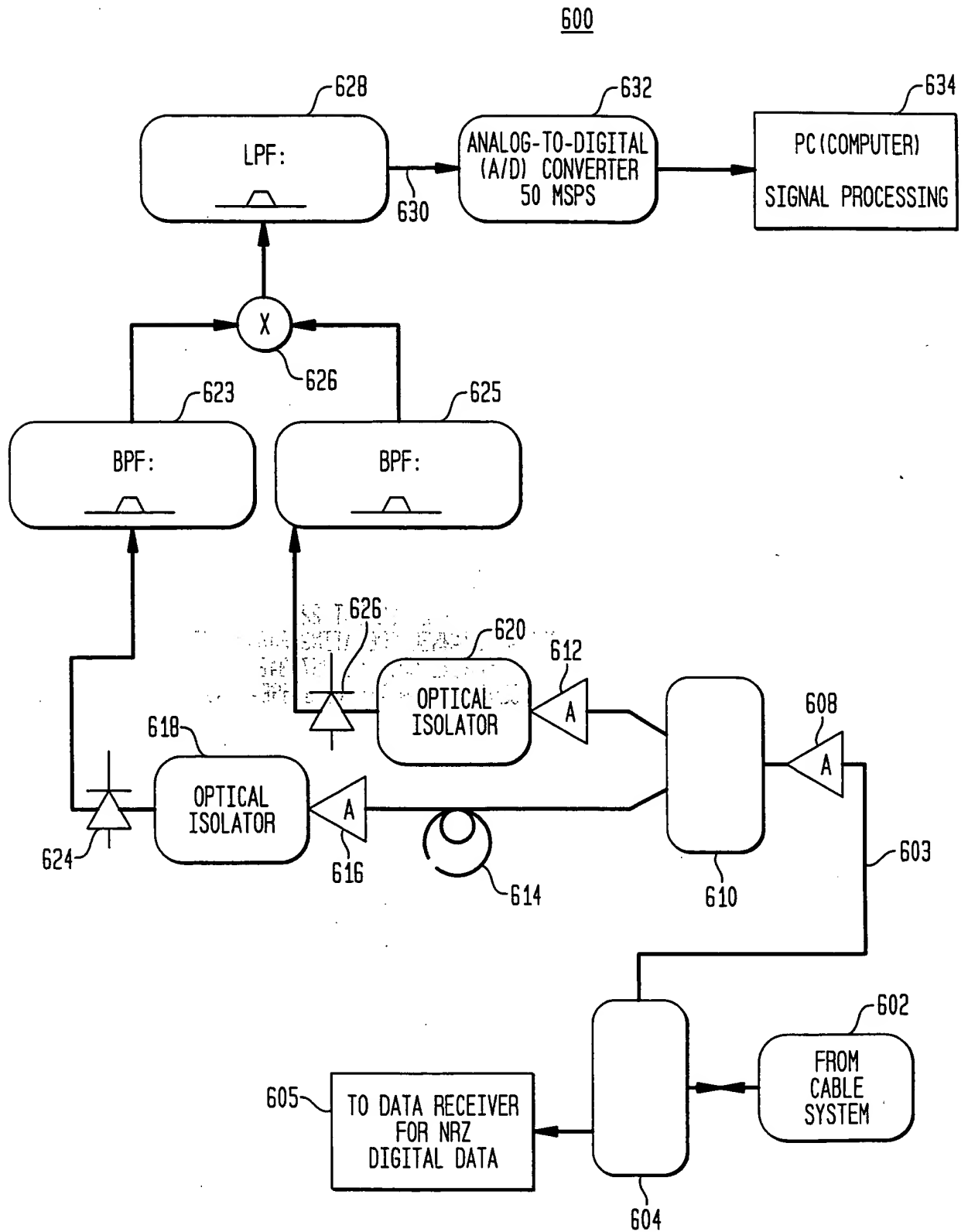
FIG. 5



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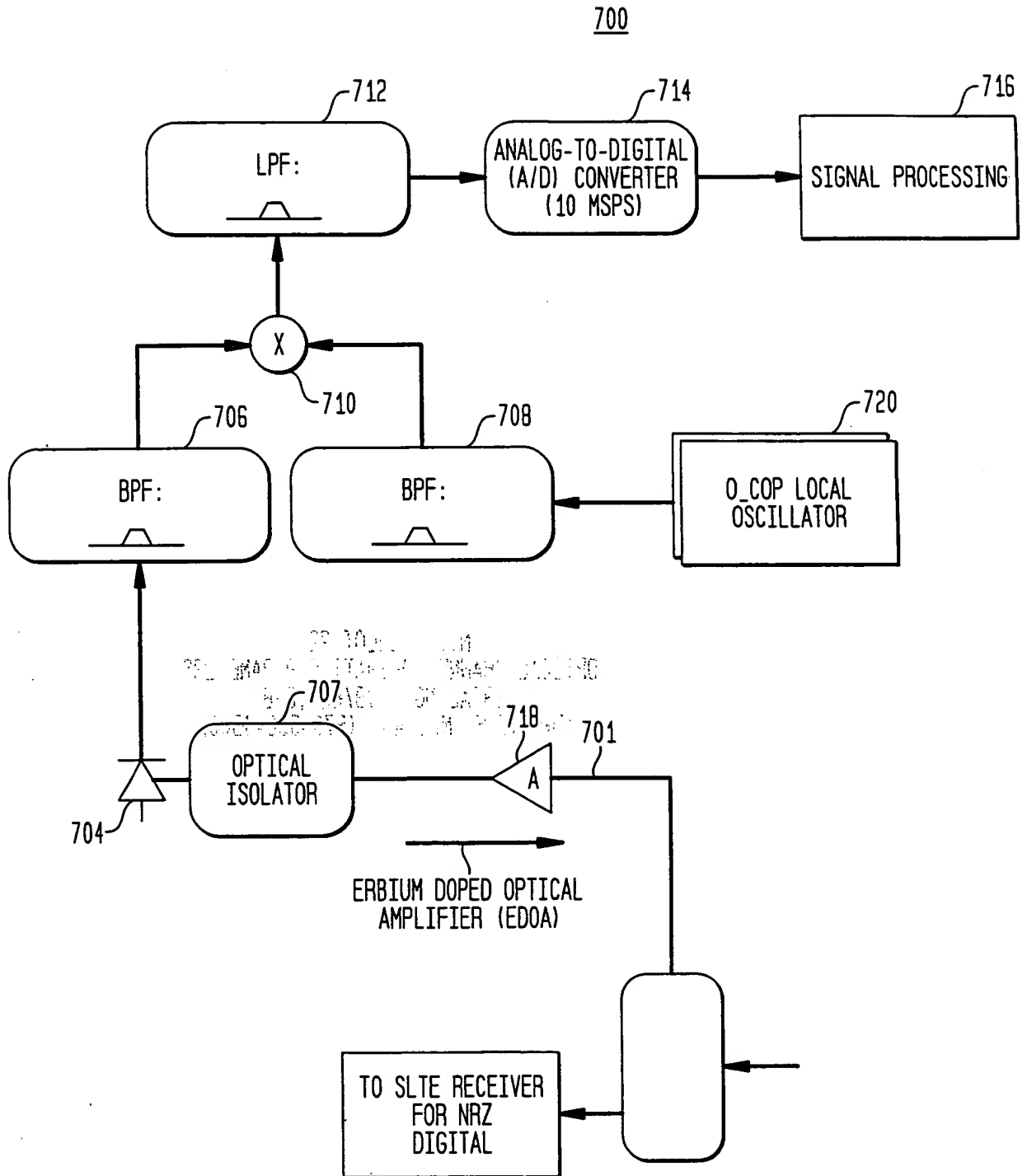
FIG. 6



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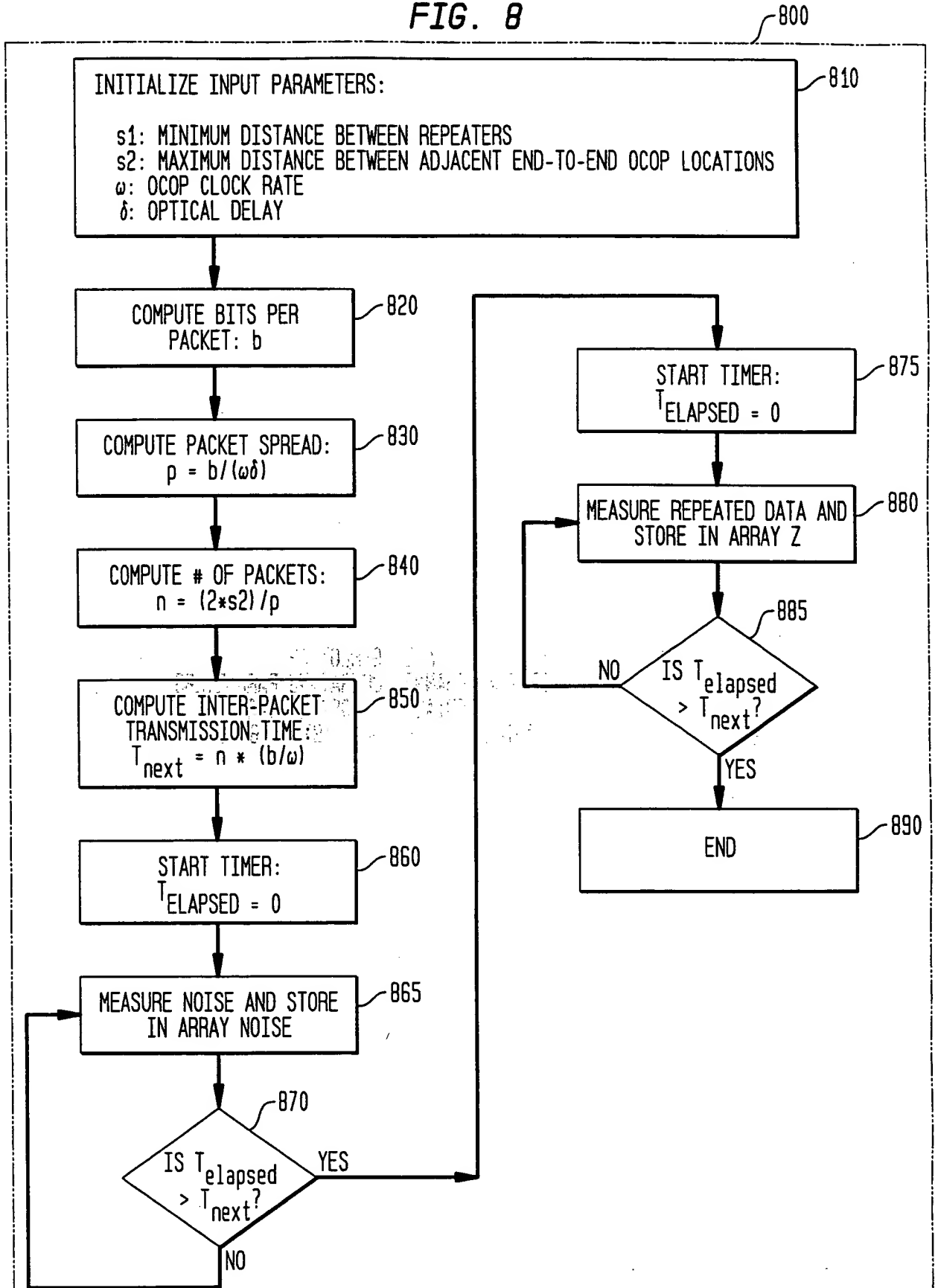
FIG. 7



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FIG. 8



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FIG. 9

